

FRS/GMRS Radios for Disaster Communications

Synopsis: I was asked at a recent CERT meeting to recommend radio brands and models. I have become reticent because it depends upon one's needs and budget; and the market, being volatile, the models are changing fast. I thought it best to provide an overview and create a smart shopper guide; rather than to simply recommend some radio that will not fill our needs.

Over-view

Why radios for disaster communications? Simply imagine a major disaster (earthquake, fire, flood, etc.) where the power, internet, cell phone, and telephone are unavailable.

Disaster services become greatly enhanced if CERT Area Incident Command Posts (ICPs) can talk to their block captains; if search and rescue teams can talk from inside the buildings that are searching; if damage assessment teams can report to their ICPs without using runners; if CERT ICPs can talk to the Emergency Operating Center (EOC) to report damages, gas main leaks, water main breaks, fires, and receive evacuation and shelter information, if CERT ICPs can talk to each other to provide mutual aid of medical personnel, nurses, EMTs, doctors, social workers, contractors, tools, rescue workers, food, water, and related supplies, etc. Radio communication may be the only way (other than runners or bicyclists) that can facilitate needed comms for family, neighbors, and our community, but it is instant. Radio comms are an essential service for disaster workers.

Family Radio Service (FRS): No License of Fees

These are the least expensive radios. Low power units can be obtained as low as \$15 each (2 for \$30); but don't be fooled by manufacturers' claims as to distance. Do not expect more than 2 blocks in "normal" terrain with buildings, earth, or trees between the two points without the need for relays. If one radio is located at a high point and has an unobstructed path to the other radio station (line of sight), then more than a mile is possible. FRS radios do not have detachable antennas and their built-in stubby antenna systems severely limit their ability to maximize reliable communications over distance.

When shopping ascertain the power level ratings on these FRS radios. The manufacturer will often hide the fact that the maximum power is ½ watt. 2 watts is optimal; while 1.5 watts is acceptable. There are many reliable brands such as Motorola, Midland, Uniden, and Ritron plus a plethora of Chinese off-brand radios. Rechargeable Li-ion batteries are the better type versus Nicad batteries; but even better obtain a model that can, in addition, take AA alkaline batteries as well, for quick replacement in the field.

Rules and models change; but because in the past Kensington CERT had decided on the Motorola MS350R we include this model in the discussion. Note that the MS355R is similar in usage. The advantage of the MS350R series is that it is repeater capable (30 channels). A disadvantage is that it does not have a removable antenna. However, it is now discontinued as are all dual channel radios.

Midland radios such as the GXT1000 series take alkaline batteries and rechargeable batteries (both) were also recommended for reasons of uniformity and familiarity. These transceivers have currently been relisted as GMRS only because of newly changed FCC rules taken in effect since 2018; but they can still be obtained through various sources as GMRS only radios. In the future there will be GMRS only and FRS only radios (no dual-service radios will be type accepted by the FCC).

See: Using Family Radio Service (FRS and General Mobile Radio Service (GMRS) Radios for Disaster Communications

(https://drive.google.com/file/d/12RyI2_QGYUD2V4sMJ1xuffFNN4B5t9vTy/view)

GMRS (General Mobile Radio Service): License Required

GMRS allows for 5 watts output on channels 1-7 and 50 watts output on channels 15-30, which includes repeater usage. It also allows for a detachable high gain antenna that can be mounted externally on a car roof or on a building. These radios are much more reliable than FRS radios; but they require a onetime license fee of \$70 and are generally more expensive than FRS radios. Nevertheless the increased cost is well worth the advantages. The **BTech GMRS-V1** (@ \$55 seems to be the best choice at the moment (2018). Get at least one high capacity spare battery. In 2018 this is the recommended GMRS radio.

For a slightly higher price (\$80) the **Wouxan KG-805G** is a listed GMRS radio, that is repeater capable, and has a removable antenna at 4 watts output. It appears to be a solid transceiver with the most desired basic features, but I have not tested it.

Many models and manufacturers of FRS and GMRS radios exist such as Btech, Icom, Luiton, WKN, Midland, Motorola, Ritron, Wouxan, Regency, Neutec, Uniden, Cobra, Harris, Repco, Relm, Spectrum, Fanon, Shinwa, Fujitsu, Raveon, CalAmp, E.F. Johnson, Futaba, Retevis, Airtronics, Aristo Craft, WR Communications, etc. Some are FRS only, GMRS only, while the dual service (both GMRS and FRS) are being relisted or discontinued. We unequivocally recommend GMRS, but remember GMRS requires a license (an onetime fee of \$70 for the entire family).

Miklor.com is a treasure house of excellent information. The articles are well written. Regarding purchasing a new radio, just like purchasing a new car, there are many factors.

See: http://www.miklor.com/COM/UV_FRS.php

Ham Radio

The best radio communication modality to consider is Amateur (ham) radio. That is because they have hundreds of frequencies to choose from, high power capabilities, and the ability to use high gain external antennas apart from the radio. Hence their distance capabilities are superior. In Kensington and El Cerrito such hams train to provide such services efficiently. A free no-cost license is required, but fortunately, there are one-day ham cram tests offered nearby that have 98% pass rates (for a small fee to cover costs). A one day class and test is offered by the Benicia Amateur Radio Club (see http://beniciaarc.com/wp/?page_id=8) Afterward, the Kensington Amateur Radio Operators/ El Cerrito Ham Operators (KaroEcho) will offer a follow up with free classes and training if needed (recommended).

In general, KaroEcho recommends starter radios at \$30-\$60 range such as the BTech UV-82HP, UV5X3, UV5R, F8HP, and similar for compatibility reasons. Of course, there are handheld 5 watt radios that are \$500 and more utilizing state of the art technology.

KaroEcho can recommend ham radios (starting at \$30), antennas, and emergency power systems. First, get your ham license, and then we can talk about the most suitable radio for your purpose. See: <https://www.karoecho.net/get-involved/getting-started> written by Rob, K6RJM, who is also CERT Area Coordinator for EC4 and a licensed GMRS operator.

Antennas

KaroEcho recommends **roof mounted base station antennas** for both GMRS and the Amateur Radio Service. These will provide 5 dB gain or better over an isotropic antenna and about 10 times the power of a short stubby antenna (affectionately called rubber ducks). They can also be also mounted for portable use. Good quality feedline (coax) is also a plus. Do not use RG-58 or RG-59 coax. Use RG-8X (mini-foam) or better. The best is RG-9913 or LMR-400.

Mobile Antennas

For greater flexibility, **mobile mag-mounted** car roof antennas are far superior to short stubbies (rubber ducks). An inexpensive mobile mag-mount antenna complete for @ \$35 is the *****Tram 11861**. It is 37" tall and the best bang/\$. Available at Walmart, Home Depot, and Ebay. The Tram 11861 is optimized for the ham bands but works very well on FRS/GMRS.

The *****Tram 1170** also comes complete with the magnet base. It is for GMRS only; and is shorter and less expensive (because it is not dual-band/ham capable). The antenna can be cut for UHF 438-485 MHz with a 20 MHz bandwidth. The design criteria is 5/8 wave over 1/2 wave with center loading coil, 4.5 dBd gain, 29" long stainless steel whip and 3 1/2" Magnet, chromed solid brass ferrule, with 15' RG-58A/U Coax Cable terminated with a UHF/PL259 connector.

For either, you will need a \$2.00 adapter to convert the UHF male plug on the antenna to the radio's SMA antenna output. The mag-mount antenna can be used portable or inside the house on a baking pan or another metal object (no stainless steel or aluminum).

There are many other antennas that can be suited to your use. In particular visit https://drive.google.com/open?id=14vhJQDKBcweRYZm2LLtS8Fdrx1e9_mYu
Or in general, <https://www.karoecho.net/workstreams/frsgmrs>

Summary:

- 1) The best is to enter the world of **amateur radio (ham)**, pass the test, get a free license, and then access thousands of channels and high power. See karoecho.net for more information
- 2) Secondly, obtain a **GMRS** license with a onetime fee of \$70 for the entire family and enjoy higher power, repeater usage, and external gain antennas. Higher gain" antennas are larger, but transmit and receive better in the most useful directions. No test is required for GMRS.
- 3) Lastly, obtain an inexpensive **FRS** radio (no fee or test is required). Use is restricted to 2 watts, no external antennas, and no repeater use.

An operating guide for the **Midland GXT** series radios:

I was recently asked to create a crib sheet for the popular **Midland GXT** series dual service (GMRS/FRS) radios, which still are available. It comes with a desk charger, car charger, headset, belt clip, but non-removable antenna. It comes with many bells and whistles which you will want to turn off. For GMRS it boasts a full 5 watt output on high power and a very useful battery pack feature that allows for both AA alkaline batteries or its included NiMH battery pack.

The on/off switch and volume control are on the top. Turn the knob clockwise as you are looking down on it to turn it on and the volume up.

To set the channel (frequency) hit the menu button until the channel number starts to flash. Then use

the up or down buttons to increase or decrease channels.

To access the menu, hold the menu button down (as above until channel number flashes on/off. Then press the menu button again. Scroll through the menu until you get to power (Pr). Toggle the power until the H (high), M (medium), or L (low) symbol appears to the upper right part of the channel number (you will see a h, m, or l). Note High power is for GMRS licensees only.

Toggle through the menu by pressing the menu key and set every menu item to off by pressing the up or down buttons.

Hit menu to continue. When everything is set to OFF (oF), then press the PTT button (large switch at upper left side). That will set the menu.

Note: This radio will transmit simplex on channels 1-22. It is not capable of duplex (repeater operation). Its other downside is that it does not have a removable antenna. Midland claims that this is a 50 channel radio. In fact, it is simply a 22 channel radio with all the channels above 22 using special private line (PL) code combinations on channels 1-22. It is high power and has many features at a low cost; but its failings as a GMRS radio are that it is not repeater capable and its antenna is not removable. It is now repackaged as a GMRS only radio (because of its 5 watt capability).

Motorola Series:

The Motorola GMRS/FRS models are also a popular low-end radio with many different models to choose from. Don't be impressed by the Motorola's well-known name in the commercial radio world, as these are their consumer low-end radios; which live more on its name than on its performance.

The popular Motorola MR300/350r/355r dual-service radios are no longer available (high power was only 1.5 watts – low power ½ watt); but some were repeater capable (30 channels). They also do NOT have removable antenna capability.

See: https://docs.google.com/document/d/1G3boDt_NpVhFfuxoouKDNxL-9cl-he4a56tMc_CLlv0/edit

For the most part the new equivalents exist in their **Talkabout “T”** series such as the T100, T260, T460, T600, etc. which are FRS only radios (less than 2 watts output). The features and power/range increase with the number and the price. They are NOT repeater capable, have no external antenna capability, and are not highly recommended. User operation is similar to the Midland GXT1000 series above.

GMRS capable radios:

#1 **GMRS-V1**. Hi power capability. **KARO-ECHO Recommends this Radio** with the caveat that you need a GMRS license. It has 5 watts, removable antenna, repeater capability, and li-ion battery, and charger. An alkaline battery pack accessory is also available. Price is \$55

<https://baofengtech.com/gmrs-v1>

#2) For a slightly higher price (\$80) the **Wouxan KG-805G** is a listed GMRS radio, that is repeater capable (30 channels), and has a removable antenna at 4 watts output. Friends testify that it is a solid transceiver with the most desired basic features, but I have not tested it. It is Ip=55 water resistant. An accessory alkaline battery pack is available for \$12 allowing 2 times the run time and independence from charger sources (uses the same battery pack as the popular KG-UVD1P and KG-UV6D models) for \$12 available at Powerwerx (see: <https://powerwerx.com/wouxun-radio-aa->

battery-pack)

#3 WLN-KDC1 – Only 16 channels but needs programming in order to be compatible with other standard FRS/GMRS radios (contact info@karoecho.net for free programming). The WLN-KDC1 is extremely simple to operate, small, is repeater capable, and comes with Li-Ion rechargeable batteries). It has hi and low power settings for GMRS and FRS operation and is low cost. The WLN-KDC1, Retevis RT-22, and Luiton LT-316 are essentially the same radio. The advantage is that they are very inexpensive (2 for \$35) and small & lightweight

#4 The Midland GXT1000 series radios (see above) Hi Power, but only 22 channels. Not repeater capable. A fixed stubby antenna with no external antenna capabilities are limitations.

For more GMRS repeater capable radios please see documents from Berkeley's GMRS CERT Repeater Archives:

A comprehensive .xlsx spreadsheet:

[https://docs.google.com/viewer?](https://docs.google.com/viewer?a=v&pid=forums&srcid=MDYxOTcxNzQ0NjQyMTAxNTg2NTIBMDQyNTQ1MTk2MzIxMjEzOTEyMzQBcHZXLVQ0a2dDZ0FKATAuMS4xAQF2Mg&authuser=0)

[a=v&pid=forums&srcid=MDYxOTcxNzQ0NjQyMTAxNTg2NTIBMDQyNTQ1MTk2MzIxMjEzOTEyMzQBcHZXLVQ0a2dDZ0FKATAuMS4xAQF2Mg&authuser=0](https://docs.google.com/viewer?a=v&pid=forums&srcid=MDYxOTcxNzQ0NjQyMTAxNTg2NTIBMDQyNTQ1MTk2MzIxMjEzOTEyMzQBcHZXLVQ0a2dDZ0FKATAuMS4xAQF2Mg&authuser=0)

and a comprehensive document here:

<https://docs.google.com/spreadsheets/d/1rd54hbIiUn3MsIqQKzMLg1DIpmHHXdXKIdOiOVvtL8c/edit#gid=0>

Visit Berkeley CERT GMRS Repeater archives at <https://groups.google.com/forum/#!forum/becertainn>

Check in to their 7:30 pm CERT net every Tuesday evening on GMRS Ch. 22 (462.725 MHz)
Transmit +5MHz with a transmit PL tone of 88.5.

Check the West Contra Costa County GMRS/FRS CERT Training Net on the first Wednesday of each month on Channel 15